

Growth and reproductive tradeoffs in the intertidal kelp *Alaria marginata* in Central California



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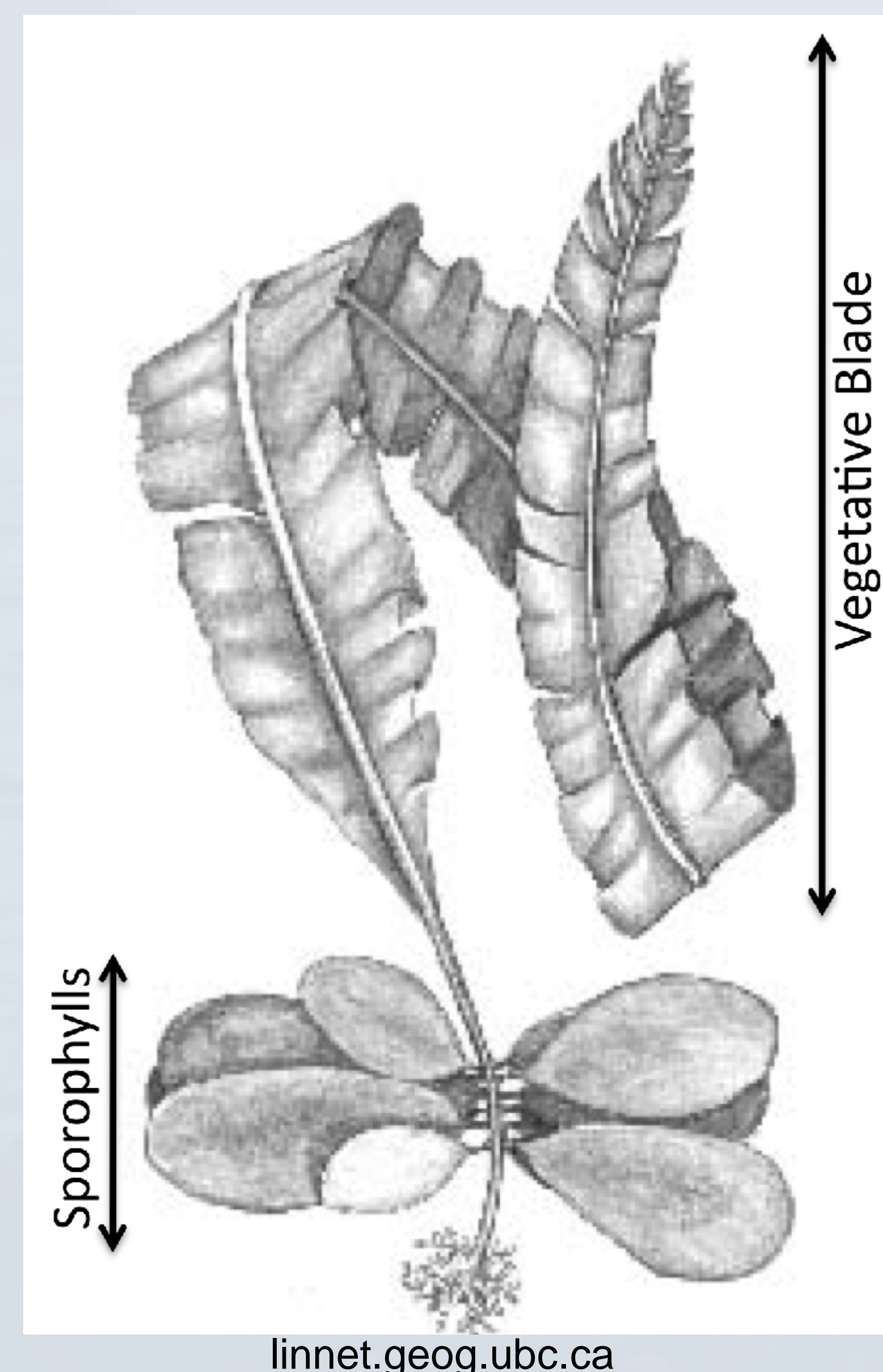


INTRODUCTION

The importance of growth and reproductive tradeoffs to the ecology of marine algae is poorly understood. Some kelp species, rather than growing and reproducing simultaneously, exhibit growth and reproduction that are offset in time (Reed et al. 1996). The intertidal kelp species *Alaria marginata* is known to initially invest in growth and later use its resources for reproduction (McConnico et al. 2005). This study examined the impact of biomass loss on the growth and reproductive response of *A. marginata* outside of its growth period.

METHODS

Alaria marginata growth and reproduction were monitored from March 2009 – August 2009 at Soberanes Point in Central California (n=40). The vegetative blade was used to estimate growth, and reproduction was quantified using soral area. Once net growth slowed (Aug), vegetative blade biomass was removed from treatment individuals. Soral punches were taken monthly to quantify zoospore output across treatments (control and biomass removal) and months, post manipulation (n=21).

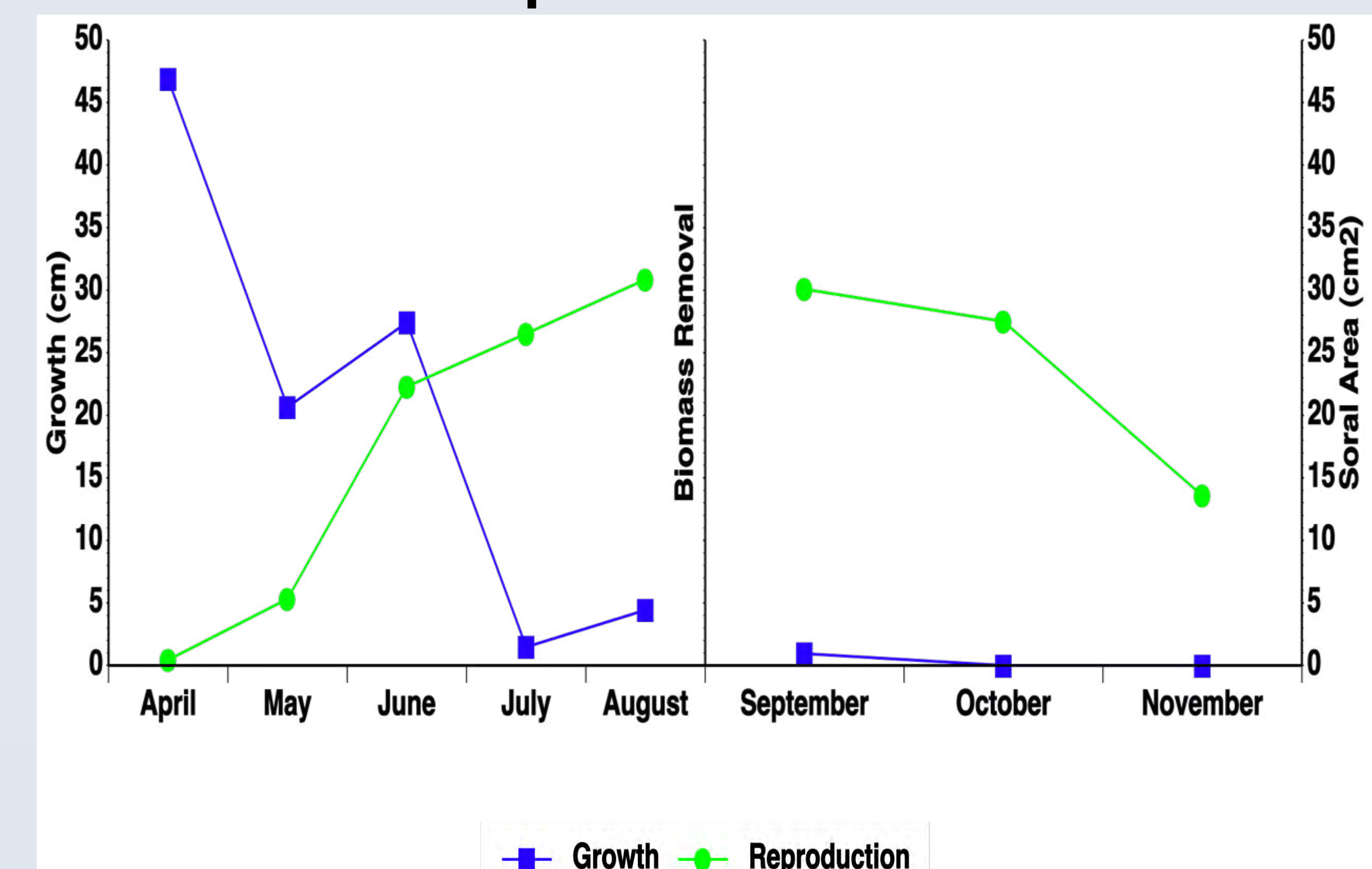


Statistical Analysis

The effect of month and biomass removal on soral output was tested using a two-way ANOVA and Fisher's LSD post-hoc comparison. A square root transformation was used to meet the equal variance and normality assumptions.

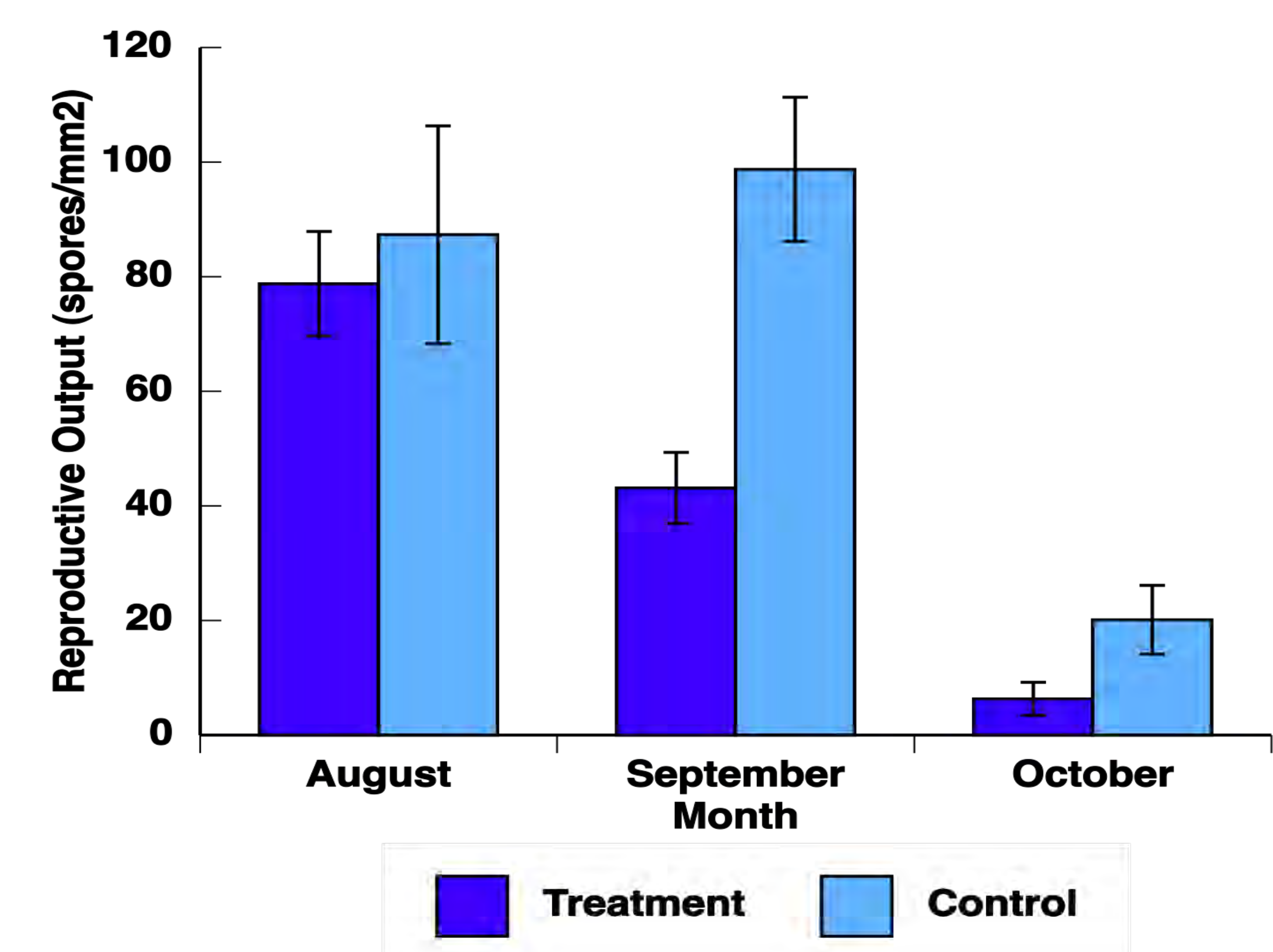
RESULTS

Growth and reproduction offset in time



Average monthly growth (cm) and soral area (cm²) pre-manipulation (left) and post-manipulation (right)

Biomass removal results in lower zoospore output



Monthly zoospore output of control and biomass removal treatments

	df	MS	f	P
treatment	1	7684.3	8.2	0.006
month	2	18699.3	19.9	<0.001
treatment*month	2	2792.7	2.9	0.061
error	45	937.3		

ANOVA on effects of treatment and month

CONCLUSIONS

Alaria marginata growth and reproduction were seen to tradeoff with growth being dominant in the spring and reproduction in the summer and fall. Biomass manipulations did not induce growth outside of the observed growth period; however, loss of biomass significantly affected zoospore output. Manipulated individuals had much lower zoospore output per mm² of soral tissue. Results from this study show that if vegetative blade material is removed after the growth period, *Alaria marginata* cannot recover lost biomass and this greatly affects its reproductive capabilities. Future experiments will study the effects of reduced zoospore output on population persistence.

References

McConnico, L. and M. S. Foster. 2005. Population biology of the intertidal annual kelp *Alaria marginata* along the Big Sur coast of California. *Journal of Experimental Marine Biology and Ecology* 324:61-75. Pfister, C. A. 1992. Costs of reproduction in an intertidal kelp: patterns of allocation and life history consequences. *Ecology* 73:1586-1596. Reed, D. C., A. W. Ebeling, T. W. Anderson, and M. Anghera. 1996. Differential reproductive responses to fluctuating resources in two seaweeds with different reproductive strategies. *Ecology* 77:300-316.

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